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(FILE 'HOME' ENTERED AT 16:44:33 ON 07 OCT 2009)

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FILE 'HCAPLUS' ENTERED AT 16:45:53 ON 07 OCT 2009  
ACT HA1637B/A

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L1 ( 538)SEA SPE=ON ABB=ON PLU=ON PT (L) CR (L) NI/ELS  
L2 ( 313)SEA SPE=ON ABB=ON PLU=ON L1 (L) 3-6/ELC.SUB  
L3 ( 1699944)SEA SPE=ON ABB=ON PLU=ON CAT# OR CATAL?  
L4 15 SEA SPE=ON ABB=ON PLU=ON L2 AND L3

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FILE HOME

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FILE HCAPLUS

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FILE COVERS 1907 - 7 Oct 2009 VOL 151 ISS 15

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REVISED CLASS FIELDS (/NCL) LAST RELOADED: Aug 2009

USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Aug 2009

HCAplus now includes complete International Patent Classification (I reclassification data for the third quarter of 2009.

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This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d 14 1-15 bib abs hitstr hitind

L4 ANSWER 1 OF 15 HCPLUS COPYRIGHT 2009 ACS on STN  
 AN 2009:275451 HCPLUS Full-text  
 DN 150:482525  
 TI Effect of reduction conditions on electrocatalytic activity of a ternary PtNiCr/C catalyst for methanol electro-oxidation  
 AU Jeon, Min Ku; Zhang, Yuan; McGinn, Paul J.  
 CS Department of Chemical and Biomolecular Engineering, University of Notre Dame, Notre Dame, IN, 46556, USA  
 SO Electrochimica Acta (2009), 54(10), 2837-2842  
 CODEN: ELCAAV; ISSN: 0013-4686  
 PB Elsevier B.V.  
 DT Journal  
 LA English  
 AB The effect of reduction conditions on a Pt28Ni36Cr36/C catalyst was studied by using two different reduction methods: H reduction and NaBH4 reduction. In H reduced catalysts, dissoln. of metallic Ni and Cr was observed during cyclic voltammetry (CV) tests, and a larger amount of Ni and Cr was dissolved when reduced at higher temps. For MeOH electrooxidn., the highest specific c.d. of 1.70 A m-2 at 600 s of the chronoamperometry tests was observed in the catalyst reduced at 300°, which was .apprx.24 times that of a Pt/C catalyst (0.0685 A m-2). In NaBH4 reduced catalysts, formation of an amorphous phase and a more Pt-rich surface was observed in x-ray diffraction and CV results, resp., with increasing amts. of NaBH4. When reduced by 50 times of the stoichiometric amount of NaBH4, the PtNiCr/C catalyst (PtNiCr-50t) showed a c.d. of 34.1 A gnoble metal -1, which was 81% higher than the 18.8 A gnoble metal -1 value of a PtRu/C catalyst at 600 s of the chronoamperometry tests. After 13 h of chronoamperometry testing, the activity of the PtNiCr-50t (15.0 A gnoble metal -1) was 110% higher than the PtRu/C catalyst (7.15 A gnoble metal -1). The PtNiCr/C catalyst shows promise as a Ru-free MeOH oxidation catalyst.  
 IT 1146619-29-5  
 RL: CAT (Catalyst use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)  
     (effect of reduction conditions on electrocatalytic activity of a ternary PtNiCr/C catalyst for methanol electro-oxidation)  
 RN 1146619-29-5 HCPLUS  
 CN Platinum alloy, base, Pt 58,Ni 22,Cr 20 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
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Pt	58	7440-06-4
Ni	22	7440-02-0
Cr	20	7440-47-3

CC 72-2 (Electrochemistry)

Section cross-reference(s): 22

ST redn condition electrocatalytic activity carbon catalyst  
methanol electrooxidn; chromium nickel platinum alloy  
catalyst electrooxidn

IT Oxidation, electrochemical  
X-ray diffraction

(effect of reduction conditions on electrocatalytic activity of a  
ternary PtNiCr/C catalyst for methanol electro-oxidation)

IT Oxidation catalysts  
(electrochem.; effect of reduction conditions on electrocatalytic  
activity of a ternary PtNiCr/C catalyst for methanol  
electro-oxidation)

IT Reduction  
(in catalyst preparation; effect of reduction conditions on  
electrocatalytic activity of a ternary PtNiCr/C catalyst  
for methanol electro-oxidation)

IT 1146619-29-5

RL: CAT (Catalyst use); PRP (Properties); TEM (Technical or  
engineered material use); USES (Uses)

(effect of reduction conditions on electrocatalytic activity of a  
ternary PtNiCr/C catalyst for methanol electro-oxidation)

IT 7440-02-0, Nickel, formation (nonpreparative) 7440-47-3, Chromium,  
formation (nonpreparative)

RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)  
(effect of reduction conditions on electrocatalytic activity of a  
ternary PtNiCr/C catalyst for methanol electro-oxidation)

IT 67-56-1, Methanol, reactions

RL: PEP (Physical, engineering or chemical process); RCT (Reactant);  
PROC (Process); RACT (Reactant or reagent)  
(effect of reduction conditions on electrocatalytic activity of a  
ternary PtNiCr/C catalyst for methanol electro-oxidation)

IT 1333-74-0, Hydrogen, reactions 16940-66-2, Sodium hydroborate

RL: RCT (Reactant); RACT (Reactant or reagent)  
(effect of reduction conditions on electrocatalytic activity of a  
ternary PtNiCr/C catalyst for methanol electro-oxidation)

OSC.G 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2  
CITINGS)

RE.CNT 38 THERE ARE 38 CITED REFERENCES AVAILABLE FOR THIS RECORD

## ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 2 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
 AN 2008:1173722 HCAPLUS Full-text  
 DN 151:110338  
 TI Combinatorial screening of ternary Pt-Ni-Cr catalysts for methanol electro-oxidation  
 AU Cooper, James S.; Jeon, Min Ku; McGinn, Paul J.  
 CS Department of Chemical and Biomolecular Engineering, University of Notre Dame, Notre Dame, IN, 46556, USA  
 SO Electrochemistry Communications (2008), 10(10), 1545-1547  
 CODEN: ECCMF9; ISSN: 1388-2481  
 PB Elsevier B.V.  
 DT Journal  
 LA English  
 AB Methanol electro-oxidation activity of ternary Pt-Ni-Cr system was studied by using a combinatorial screening method. A Pt-Ni-Cr thin-film library was prepared by sputtering and quickly characterized by a multichannel multielectrode analyzer. Among the 63 different composition thin-film catalysts, Pt28Ni36Cr36 showed the highest methanol electro-oxidation activity and good stability. This new composition was also studied in its powder form by synthesizing and characterizing Pt28Ni36Cr36/C catalyst. In chronoamperometry testing, the Pt28Ni36Cr36/C catalyst exhibited "decay-free" behavior during 600 s operation by keeping its c.d. up to 97.1% of its peak c.d., while the current densities of Pt/C and Pt50Ru50/C catalysts decreased to 14.0% and 60.3% of their peak current densities, resp. At 600 s operation, c.d. of the Pt28Ni36Cr36/C catalyst was 23.8 A gnoble metal -1, while that of those of the Pt/C and Pt50Ru50/C catalysts were 2.74 and 18.8 A gnoble metal -1, resp.  
 IT 177835-27-7  
 RL: CAT (Catalyst use); USES (Uses)  
 (combinatorial screening of ternary Pt-Ni-Cr catalysts  
 for methanol electro-oxidation in)  
 RN 177835-27-7 HCAPLUS  
 CN Platinum alloy, base, Pt,Cr,Ni (CA INDEX NAME)

Component	Component
	Registry Number
=====+=====	
Pt	7440-06-4
Cr	7440-47-3
Ni	7440-02-0

IT 1146619-29-5  
 RL: CAT (Catalyst use); FMU (Formation, unclassified); PEP  
 (Physical, engineering or chemical process); FORM (Formation,

nonpreparative); PROC (Process); USES (Uses)  
 (deposition of ternary Pt-Ni-Cr catalysts for methanol  
 electro-oxidation on carbon support in solution containing)

RN 1146619-29-5 HCPLUS

CN Platinum alloy, base, Pt 58,Ni 22,Cr 20 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	58	7440-06-4
Ni	22	7440-02-0
Cr	20	7440-47-3

CC 72-2 (Electrochemistry)

Section cross-reference(s): 23, 52, 56, 67, 78

IT X-ray diffraction  
 (by Pt, Pt-Ru and ternary Pt-Ni-Cr catalysts deposited  
 on carbon support)

IT Oxidation, electrochemical  
 (combinatorial screening of ternary Pt-Ni-Cr catalysts  
 for methanol electro-oxidation)

IT Fuel cells  
 (combinatorial screening of ternary Pt-Ni-Cr catalysts  
 for methanol electro-oxidation in)

IT Catalysts  
 (electrocatalysts; combinatorial screening of ternary Pt-Ni-Cr  
 catalysts for methanol electro-oxidation)

IT Coating process  
 (electroless; of ternary Pt-Ni-Cr catalysts for  
 methanol electro-oxidation on carbon support)

IT Chronoamperometry  
 Current density  
 (of methanol oxidation on Pt, Pt-Ru and ternary Pt-Ni-Cr  
 catalysts deposited on carbon support in sulfuric acid  
 soln)

IT Sputtering  
 (preparation of ternary Pt-Ni-Cr catalysts for methanol  
 electro-oxidation by)

IT Multilayers  
 (preparation of ternary Pt-Ni-Cr catalysts for methanol  
 electro-oxidation by sputtering)

IT Combinatorial chemistry  
 (solid-phase; combinatorial screening of ternary Pt-Ni-Cr  
 catalysts for methanol electro-oxidation)

IT 67-56-1, Methanol, reactions

RL: PEP (Physical, engineering or chemical process); RCT (Reactant);  
 PROC (Process); RACT (Reactant or reagent)

- (combinatorial screening of ternary Pt-Ni-Cr catalysts  
for methanol electro-oxidation)
- IT 177835-27-7  
 RL: CAT (Catalyst use); USES (Uses)  
 (combinatorial screening of ternary Pt-Ni-Cr catalysts  
for methanol electro-oxidation in)
- IT 7440-06-4, Platinum, uses 12714-36-2, Platinum 50, ruthenium  
50(atomic)  
 RL: CAT (Catalyst use); FMU (Formation, unclassified); PEP  
(Physical, engineering or chemical process); FORM (Formation,  
nonpreparative); PROC (Process); USES (Uses)  
 (deposition of ternary Pt-Ni-Cr catalysts for methanol  
electro-oxidation on carbon support)
- IT 7440-44-0, Carbon, uses  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (deposition of ternary Pt-Ni-Cr catalysts for methanol  
electro-oxidation on carbon support)
- IT 1146619-29-5  
 RL: CAT (Catalyst use); FMU (Formation, unclassified); PEP  
(Physical, engineering or chemical process); FORM (Formation,  
nonpreparative); PROC (Process); USES (Uses)  
 (deposition of ternary Pt-Ni-Cr catalysts for methanol  
electro-oxidation on carbon support in solution containing)
- IT 7718-54-9, Nickel dichloride, reactions 13548-38-4, Chromium  
nitrate 16940-66-2, Sodium tetrahydroborate 16941-12-1,  
Hexachloroplatinic acid  
 RL: PEP (Physical, engineering or chemical process); RCT (Reactant);  
 PROC (Process); RACT (Reactant or reagent)  
 (deposition of ternary Pt-Ni-Cr catalysts for methanol  
electro-oxidation on carbon support in solution containing)
- IT 7664-93-9, Sulfuric acid, uses  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (electrooxidn. of methanol oxidation on Pt, Pt-Ru and ternary  
 Pt-Ni-Cr catalysts deposited on carbon support in  
 sulfuric acid soln)
- IT 7440-21-3, Silicon, uses  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (preparation of ternary Pt-Ni-Cr catalysts for methanol  
electro-oxidation by sputtering on)
- OSC.G 5 THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD (5  
CITINGS)
- RE.CNT 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 3 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
 AN 2007:1243429 HCAPLUS Full-text  
 DN 147:505407

TI Catalyst, membrane electrode assembly and fuel cell  
 IN Mei, Wu; Fukazawa, Taishi; Sato, Takahiro; Mizutani, Itsuko;  
 Kobayashi, Tsuyoshi; Nakano, Yoshihiko

PA Japan

SO U.S. Pat. Appl. Publ., 17 pp.

CODEN: USXXCO

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 20070254806	A1	20071101	US 2007-737393	200704 19
	JP 2007317641	A	20071206	JP 2007-57450	200703 07
	CN 101064368	A	20071031	CN 2007-10104770	200704 26
	KR 2007106457	A	20071101	KR 2007-41472	200704 27
PRAI	KR 873536	B1	20081211		
	JP 2006-126854	A	20060428		
	JP 2007-57450	A	20070307		

#### ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A catalyst includes a conductive carrier and catalyst particles. The catalyst particles are supported on the conductive carrier and have a composition represented by the formula: PtxRuyTz, where the T-element is at least one element selected from the group consisting of V, Nb and Hf, x is 30 to 60 atomic%, y is 20 to 50 atomic% and z is 5 to 50 atomic%. An area of a peak derived from a metal bond of a T-element is 15% or more of an area of a peak derived from an oxygen bond of the T-element in a spectrum obtained by X-ray photoelectron spectroscopic method.

IT 955120-11-3P 955120-26-0P

RL: CAT (Catalyst use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(catalyst, membrane electrode assembly and fuel cell)

RN 955120-11-3 HCAPLUS

CN Platinum alloy, base, Pt 65,Ru 23,Ni 6.8,V 3.2,Cr 1.6 (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	65	7440-06-4
Ru	23	7440-18-8
Ni	6.8	7440-02-0
V	3.2	7440-62-2
Cr	1.6	7440-47-3

RN 955120-26-0 HCAPLUS  
 CN Platinum alloy, base, Pt 61,Ru 17,Ni 14,W 7.1,Cr 1.2 (CA INDEX  
 NAME)

Component	Component Percent	Component Registry Number
Pt	61	7440-06-4
Ru	17	7440-18-8
Ni	14	7440-02-0
W	7.1	7440-33-7
Cr	1.2	7440-47-3

INCL 502325000; 429044000  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 Section cross-reference(s): 56, 67  
 ST fuel cell catalyst membrane electrode assembly  
 IT Fuel cells  
 Membrane electrodes  
 Sputtering  
 (catalyst, membrane electrode assembly and fuel cell)  
 IT Carbon black  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalyst, membrane electrode assembly and fuel cell)  
 IT Catalysts  
 (electrocatalysts; catalyst, membrane electrode  
 assembly and fuel cell)  
 IT Polyoxalkylenes  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (fluorine- and sulfo-containing, ionomers; catalyst,  
 membrane electrode assembly and fuel cell)  
 IT Fluoropolymers  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (polyoxalkylene-, sulfo-containing, ionomers; catalyst,  
 membrane electrode assembly and fuel cell)  
 IT Ionomers  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (polyoxalkylenes, fluorine- and sulfo-containing; catalyst  
 , membrane electrode assembly and fuel cell)  
 IT 955119-82-1P 955119-84-3P 955119-86-5P 955119-87-6P

955119-89-8P	955119-91-2P	955119-92-3P	955119-93-4P
955119-94-5P	955119-95-6P	955119-96-7P	955119-97-8P
955119-98-9P	955119-99-0P	955120-00-0P	955120-01-1P
955120-02-2P	955120-03-3P	955120-04-4P	955120-05-5P
955120-06-6P	955120-07-7P	955120-08-8P	955120-09-9P
955120-10-2P	955120-11-3P	955120-12-4P	955120-13-5P
955120-14-6P	955120-15-7P	955120-16-8P	955120-17-9P
955120-18-0P	955120-19-1P	955120-20-4P	955120-21-5P
955120-22-6P	955120-23-7P	955120-24-8P	955120-25-9P
955120-26-0P	955120-27-1P	955120-28-2P	955120-29-3P
955120-30-6P	955120-31-7P	955120-32-8P	955120-33-9P
955120-34-0P	955120-35-1P	955120-36-2P	955120-37-3P
955120-38-4P	955120-39-5P		

RL: CAT (Catalyst use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(catalyst, membrane electrode assembly and fuel cell)

IT 67-56-1, Methanol, uses 66796-30-3, Nafion 117

RL: TEM (Technical or engineered material use); USES (Uses)

(catalyst, membrane electrode assembly and fuel cell)

L4 ANSWER 4 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
AN 2006:1235451 HCAPLUS Full-text

DN 146:187385

TI Performance and stability of Pt-based ternary alloy catalysts for PEMFC

AU Seo, Aeree; Lee, Jaeseung; Han, Kookil; Kim, Hasuck

CS Department of Chemistry, Seoul National University, Seoul, 151-747,  
S. Korea

SO Electrochimica Acta (2006), 52(4), 1603-1611

CODEN: ELCAAV; ISSN: 0013-4686

PB Elsevier B.V.

DT Journal

LA English

AB C-supported Pt-based ternary alloy electrocatalysts were prepared by incipient wetness method to study the enhanced activity of O reduction in PEMFCs. To measure the catalytic activity and stability of the cathode alloy catalysts (electrodes containing Pt loading of 0.3 mg/cm<sup>2</sup>, 20% Pt/C, E-TEK), I-V polarization curves were obtained. All alloy catalysts showed higher performances than Pt/C. Pt formed alloys with transition metals - the electronic state of Pt and the nearest neighbor Pt-Pt distance changes and this influences the electrocatalytic activity for O reduction. Long-term stability was tested for the Pt6Co1Cr1/C alloy catalyst for 500 h. According to XPS, the lower oxide component with Pt6Co1Cr1/C electrocatalyst provides a large portion of Pt in metallic species in the electrocatalyst and it seems to be mainly responsible for its enhanced activity towards O reduction

IT 921611-57-6

RL: CAT (Catalyst use); PRP (Properties); TEM (Technical or  
 engineered material use); USES (Uses)  
 (performance and stability of Pt-based ternary alloy  
 catalysts for PEMFCs)

RN 921611-57-6 HCPLUS

CN Platinum alloy, base, Pt 92, Ni 4.5, Cr 3.8 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	92	7440-06-4
Ni	4.5	7440-02-0
Cr	3.8	7440-47-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 Section cross-reference(s): 56, 67

ST platinum ternary alloy cathode catalyst fuel cell

IT Reduction catalysts

(electrochem.; performance and stability of Pt-based ternary  
 alloy catalysts for PEMFCs)

IT Fuel cell cathodes

(performance and stability of Pt-based ternary alloy  
 catalysts for PEMFCs)

IT Fuel cells

(proton exchange membrane; performance and stability of Pt-based  
 ternary alloy catalysts for PEMFCs)

IT Alloys, uses

RL: CAT (Catalyst use); PRP (Properties); TEM (Technical or  
 engineered material use); USES (Uses)  
 (ternary; performance and stability of Pt-based ternary alloy  
 catalysts for PEMFCs)

IT 7440-44-0, Carbon, uses

RL: CAT (Catalyst use); TEM (Technical or engineered material use);  
 USES (Uses)

(catalyst support; performance and stability of  
 Pt-based ternary alloy catalysts for PEMFCs)

IT 921611-55-4 921611-56-5 921611-57-6 921611-58-7

921611-59-8 921611-60-1 921611-61-2

RL: CAT (Catalyst use); PRP (Properties); TEM (Technical or  
 engineered material use); USES (Uses)

(performance and stability of Pt-based ternary alloy  
 catalysts for PEMFCs)

OSC.G 11 THERE ARE 11 CAPLUS RECORDS THAT CITE THIS RECORD (11  
 CITINGS)

RE.CNT 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD  
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 5 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
 AN 2005:1155369 HCAPLUS Full-text

DN 143:424682

TI Membrane-electrode assembly and fuel cell system

IN Cho, Kyu-Woong

PA S. Korea

SO U.S. Pat. Appl. Publ., 11 pp.

CODEN: USXXCO

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 20050238936	A1	20051027	US 2005-114103	200504 26
	KR 2005103648	A	20051101	KR 2004-28909	200404 27
	CN 1694288	A	20051109	CN 2005-10079254	200504 27
	CN 100352089	C	20071128		
	JP 2005317546	A	20051110	JP 2005-130506	200504 27

PRAI KR 2004-28909 A 20040427

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A membrane-electrode assembly is described for a fuel cell and fuel cell system. The membrane-electrode assembly includes a catalyst layer formed on both sides of a polymer electrolyte membrane, a platinum-metal alloy catalyst included in the catalyst layer, where the alloy catalyst shows a diffraction peak in a 110 plane at a degree 2θ=30-35 in the measurement of X-ray (CuK α) diffraction. The alloy catalyst has an excellent stability due to the compact crystal lattice structure of the catalyst, and it incurs low production costs and has sensitive reactivity.

IT 123553-84-4

RL: CAT (Catalyst use); USES (Uses)

(membrane electrode assembly and fuel cell system)

RN 123553-84-4 HCAPLUS

CN Platinum alloy, base, Pt 78, Ni 12, Cr 10 (9CI) (CA INDEX NAME)

Component	Component	Component
Percent	Registry Number	

Pt	78	7440-06-4
Ni	12	7440-02-0
Cr	10	7440-47-3

IC ICM H01M004-92  
ICS H01M008-10; B01J021-18  
INCL 429030000; 429040000; 502185000  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 55, 56, 67  
IT 1344-28-1, Alumina, uses 7439-89-6, Iron, uses 7440-02-0,  
Nickel, uses 7440-06-4, Platinum, uses 7440-44-0, Carbon, uses  
7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses 7631-86-9,  
Silica, uses 11105-45-6 37256-04-5, Nickel 50, platinum 50  
(atomic) 37274-26-3, Iron 50, platinum 50 (atomic) 39305-53-8,  
Cobalt 50, platinum 50 (atomic) 77506-59-3, Chromium 50, platinum  
50 (atomic) 123553-84-4  
RL: CAT (Catalyst use); USES (Uses)  
(membrane electrode assembly and fuel cell system)

L4 ANSWER 6 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
AN 2005:16051 HCAPLUS Full-text  
DN 142:117646  
TI Platinum-chromium-copper/nickel fuel cell catalyst  
IN Chondroudis, Konstantinos; Gorer, Alexander; Devenney, Martin; He,  
Ting; Oyanagi, Hiroyuki; Giaquinta, Daniel M.; Urata, Kenta; Fukuda,  
Hiroichi; Fan, Qun; Strasser, Peter  
PA Symyx Technologies, Inc., USA; Honda Giken Kogyo Kabushiki Kaisha  
SO PCT Int. Appl., 70 pp.  
DT Patent 10/559,637  
LA English

PATENT NO.		KIND	DATE	APPLICATION NO.	DATE
PI	WO 2005001967	A1	20050106	WO 2004-US17333	200406 03
W:	AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW:	BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW,				

AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ,  
 DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL,  
 PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
 GW, ML, MR, NE, SN, TD, TG

US 20060251952 A1 20061109 US 2005-559637

200512  
02

PRAI US 2003-475559P P 20030603  
 WO 2004-US17333 W 20040603

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A fuel cell catalyst comprising platinum, chromium, and copper, nickel or a combination thereof is disclosed. In one or more embodiments, the concentration of platinum is less than 50 atomic%, and/or the concentration of chromium is less than 30 atomic%, and/or the concentration of copper, nickel, or a combination thereof is at least 35 atomic%.

IT 821770-72-3P 821770-74-5P  
 821770-75-6P 821770-76-7P 821770-97-2P  
 821770-98-3P 821770-99-4P 821771-00-0P  
 821771-01-1P 821771-02-2P 821771-03-3P  
 821771-04-4P 821771-05-5P 821771-06-6P  
 821771-07-7P 821771-08-8P 821771-09-9P  
 821771-10-2P 821771-11-3P 821771-12-4P  
 821771-13-5P 821771-14-6P 821771-15-7P  
 821771-16-8P 821771-17-9P 821771-19-1P  
 821771-20-4P 821771-21-5P 821771-22-6P  
 821771-23-7P

RL: CAT (Catalyst use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
 (platinum-chromium-copper/nickel fuel cell catalyst)

RN 821770-72-3 HCPLUS

CN Platinum alloy, base, Pt 46,Ni 42,Cr 12 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	46	7440-06-4
Ni	42	7440-02-0
Cr	12	7440-47-3

RN 821770-74-5 HCPLUS

CN Platinum alloy, base, Pt 48,Cu 31,Cr 13,Ni 7.3 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	46	7440-06-4
Ni	42	7440-02-0
Cr	12	7440-47-3

Pt	48	7440-06-4
Cu	31	7440-50-8
Cr	13	7440-47-3
Ni	7.3	7440-02-0

RN 821770-75-6 HCAPLUS

CN Platinum alloy, base, Pt 49,Cu 24,Ni 15,Cr 13 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	49	7440-06-4
Cu	24	7440-50-8
Ni	15	7440-02-0
Cr	13	7440-47-3

RN 821770-76-7 HCAPLUS

CN Platinum alloy, base, Pt 70,Ni 21,Cr 9.3 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	70	7440-06-4
Ni	21	7440-02-0
Cr	9.3	7440-47-3

RN 821770-97-2 HCAPLUS

CN Nickel alloy, base, Ni 48,Pt 46,Cr 6.1 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Ni	48	7440-02-0
Pt	46	7440-06-4
Cr	6.1	7440-47-3

RN 821770-98-3 HCAPLUS

CN Platinum alloy, base, Pt 59,Ni 36,Cr 5.3 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	59	7440-06-4
Ni	36	7440-02-0
Cr	5.3	7440-47-3

RN 821770-99-4 HCAPLUS

CN Platinum alloy, base, Pt 60,Ni 30,Cr 11 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	60	7440-06-4
Ni	30	7440-02-0
Cr	11	7440-47-3

RN 821771-00-0 HCPLUS

CN Platinum alloy, base, Pt 46,Ni 35,Cr 19 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	46	7440-06-4
Ni	35	7440-02-0
Cr	19	7440-47-3

RN 821771-01-1 HCPLUS

CN Platinum alloy, base, Pt 60,Ni 24,Cr 16 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	60	7440-06-4
Ni	24	7440-02-0
Cr	16	7440-47-3

RN 821771-02-2 HCPLUS

CN Platinum alloy, base, Pt 69,Ni 26,Cr 4.6 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	69	7440-06-4
Ni	26	7440-02-0
Cr	4.6	7440-47-3

RN 821771-03-3 HCPLUS

CN Platinum alloy, base, Pt 77,Ni 19,Cr 4.1 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	77	7440-06-4
Ni	19	7440-02-0

Cr            4.1            7440-47-3

RN    821771-04-4   HCAPLUS  
 CN    Platinum alloy, base, Pt 85,Cr 11,Ni 4.2 (9CI)   (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	85	7440-06-4
Cr	11	7440-47-3
Ni	4.2	7440-02-0

RN    821771-05-5   HCAPLUS  
 CN    Platinum alloy, base, Pt 71,Cr 19,Ni 11 (9CI)   (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	71	7440-06-4
Cr	19	7440-47-3
Ni	11	7440-02-0

RN    821771-06-6   HCAPLUS  
 CN    Platinum alloy, base, Pt 70,Ni 16,Cr 14 (9CI)   (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	70	7440-06-4
Ni	16	7440-02-0
Cr	14	7440-47-3

RN    821771-07-7   HCAPLUS  
 CN    Platinum alloy, base, Pt 60,Cr 21,Ni 18 (9CI)   (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	60	7440-06-4
Cr	21	7440-47-3
Ni	18	7440-02-0

RN    821771-08-8   HCAPLUS  
 CN    Platinum alloy, base, Pt 89,Ni 7.6,Cr 3.4 (9CI)   (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	89	7440-06-4
Ni	7.6	7440-02-0
Cr	3.4	7440-47-3

RN 821771-09-9 HCAPLUS  
 CN Platinum alloy, base, Pt 78,Ni 14,Cr 8.3 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	78	7440-06-4
Ni	14	7440-02-0
Cr	8.3	7440-47-3

RN 821771-10-2 HCAPLUS  
 CN Platinum alloy, base, Pt 78,Cr 12,Ni 9.4 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	78	7440-06-4
Cr	12	7440-47-3
Ni	9.4	7440-02-0

RN 821771-11-3 HCAPLUS  
 CN Platinum alloy, base, Pt 71,Cr 24,Ni 5.3 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	71	7440-06-4
Cr	24	7440-47-3
Ni	5.3	7440-02-0

RN 821771-12-4 HCAPLUS  
 CN Platinum alloy, base, Pt 93,Ni 3.5,Cr 3.1 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Pt	93	7440-06-4
Ni	3.5	7440-02-0
Cr	3.1	7440-47-3

RN 821771-13-5 HCAPLUS  
 CN Platinum alloy, base, Pt 61,Cr 27,Ni 12 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	61	7440-06-4
Cr	27	7440-47-3
Ni	12	7440-02-0

RN 821771-14-6 HCAPLUS

CN Platinum alloy, base, Pt 84,Ni 13,Cr 3.7 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	84	7440-06-4
Ni	13	7440-02-0
Cr	3.7	7440-47-3

RN 821771-15-7 HCAPLUS

CN Platinum alloy, base, Pt 89,Cr 6.8,Ni 3.8 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	89	7440-06-4
Cr	6.8	7440-47-3
Ni	3.8	7440-02-0

RN 821771-16-8 HCAPLUS

CN Platinum alloy, base, Pt 47,Cr 31,Ni 21 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	47	7440-06-4
Cr	31	7440-47-3
Ni	21	7440-02-0

RN 821771-17-9 HCAPLUS

CN Platinum alloy, base, Pt 79,Cr 17,Ni 4.7 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number

Pt	79	7440-06-4
Cr	17	7440-47-3
Ni	4.7	7440-02-0

RN 821771-19-1 HCAPLUS  
 CN Platinum alloy, base, Pt 84,Ni 8.4,Cr 7.5 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	84	7440-06-4
Ni	8.4	7440-02-0
Cr	7.5	7440-47-3

RN 821771-20-4 HCAPLUS  
 CN Platinum alloy, base, Pt 61,Cr 33,Ni 6.1 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	61	7440-06-4
Cr	33	7440-47-3
Ni	6.1	7440-02-0

RN 821771-21-5 HCAPLUS  
 CN Platinum alloy, base, Pt 48,Cr 45,Ni 7.2 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	48	7440-06-4
Cr	45	7440-47-3
Ni	7.2	7440-02-0

RN 821771-22-6 HCAPLUS  
 CN Platinum alloy, base, Pt 47,Ni 28,Cr 25 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	47	7440-06-4
Ni	28	7440-02-0
Cr	25	7440-47-3

RN 821771-23-7 HCAPLUS  
 CN Platinum alloy, base, Pt 48,Cr 38,Ni 14 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
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Pt	48	7440-06-4		
Cr	38	7440-47-3		
Ni	14	7440-02-0		
<b>IC</b>	<b>ICM</b>	<b>H01M004-92</b>		
	<b>ICS</b>	<b>H01M004-96; B01J023-26; B01J023-42; B01J023-72; B01J023-755;</b> <b>B01J023-86; B01J023-89; H01M008-10</b>		
<b>CC</b>	<b>52-2 (Electrochemical, Radiational, and Thermal Energy Technology)</b>			
<b>ST</b>	<b>Section cross-reference(s): 56, 67</b>			
<b>IT</b>	<b>platinum chromium copper nickel fuel cell catalyst</b>			
<b>IT</b>	<b>Catalysts</b>			
	(electrocatalysts; platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>Fuels</b>			
	(fossil; platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>Municipal refuse</b>			
	(off-gas; platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>Hydrocarbons, uses</b>			
	RL: TEM (Technical or engineered material use); USES (Uses) (oxy; platinum-chromium-copper/nickel fuel cell catalyst )			
<b>IT</b>	<b>Fuel cell electrodes</b>			
	Photolithography (platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>Hydrocarbons, uses</b>			
	RL: TEM (Technical or engineered material use); USES (Uses) (platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>Fuel cells</b>			
	(proton exchange membrane; platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>Magnetron sputtering</b>			
	(radio-frequency; platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>7440-06-4, Platinum, uses</b>			
	RL: CAT (Catalyst use); USES (Uses) (platinum-chromium-copper/nickel fuel cell catalyst)			
<b>IT</b>	<b>821770-72-3P</b>	<b>821770-73-4P</b>	<b>821770-74-5P</b>	
	<b>821770-75-6P</b>	<b>821770-76-7P</b>	<b>821770-77-8P</b>	
	<b>821770-78-9P</b>	<b>821770-79-0P</b>	<b>821770-80-3P</b>	<b>821770-81-4P</b>
	<b>821770-82-5P</b>	<b>821770-83-6P</b>	<b>821770-84-7P</b>	<b>821770-85-8P</b>
	<b>821770-86-9P</b>	<b>821770-87-0P</b>	<b>821770-88-1P</b>	<b>821770-89-2P</b>
	<b>821770-90-5P</b>	<b>821770-91-6P</b>	<b>821770-92-7P</b>	<b>821770-93-8P</b>
	<b>821770-94-9P</b>	<b>821770-95-0P</b>	<b>821770-96-1P</b>	<b>821770-97-2P</b>
	<b>821770-98-3P</b>	<b>821770-99-4P</b>	<b>821771-00-0P</b>	
	<b>821771-01-1P</b>	<b>821771-02-2P</b>	<b>821771-03-3P</b>	

821771-04-4P    821771-05-5P    821771-06-6P  
 821771-07-7P    821771-08-8P    821771-09-9P  
 821771-10-2P    821771-11-3P    821771-12-4P  
 821771-13-5P    821771-14-6P    821771-15-7P  
 821771-16-8P    821771-17-9P    821771-18-0P  
 821771-19-1P    821771-20-4P    821771-21-5P  
 821771-22-6P    821771-23-7P    821771-24-8P  
 821771-25-9P    821771-27-1P    821771-28-2P    821771-29-3P  
 821771-30-6P    821771-31-7P    821771-32-8P    821771-33-9P  
 821771-34-0P    821771-35-1P    821771-36-2P    821771-37-3P  
 821771-38-4P    821771-39-5P    821771-40-8P    821771-41-9P  
 821771-42-0P    821771-43-1P    821771-44-2P    821771-45-3P  
 821771-46-4P    821771-47-5P    821771-48-6P    821771-49-7P  
 821771-50-0P

RL: CAT (Catalyst use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
 (platinum-chromium-copper/nickel fuel cell catalyst)

IT 7782-44-7, Oxygen, processes

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
 (platinum-chromium-copper/nickel fuel cell catalyst)

IT 67-56-1, Methanol, uses 1333-74-0, Hydrogen, uses

RL: TEM (Technical or engineered material use); USES (Uses)  
 (platinum-chromium-copper/nickel fuel cell catalyst)

OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 7 OF 15 HCPLUS COPYRIGHT 2009 ACS on STN  
AN 2003:582740 HCPLUS Full-text

DN 139:137073

TI Production of porous structure containing functional compound fine particles dispersed in overall position

IN Yamauchi, Goro; Nakajima, Hideo; Taira, Hirohito; Mabuchi, Mamoru

PA Japan Science and Technology Corporation, Japan; National Institute of Advanced Industrial Science and Technology

SO Jpn. Kokai Tokkyo Koho, 5 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI JP 2003213352 A 20030730 JP 2002-17453

200201

JP 4328052 B2 20090909  
 PRAI JP 2002-17453 20020125

AB The title porous structure is composed of a matrix made of an element Y, and dispersed fine particles made of a X-Z compound (X = element showing gaseous phase at an ordinary temperature, Z = element showing high affinity with X). The porous structure is produced by heating a porous material (porosity 0.1-95.0%) made of Y containing 0.00001-70 atomic% of Z in an atmospheric containing X with partial pressure capable of forming the X-Z compound but insufficient for forming a Y-X compound, to precipitate the X-Z compound in the form of grains or plate-like in overall position of the porous material. 00 X Si,Mn,P,Al,Zn,Ti,Ni,Cr,Co,Fe,Be,Mg,Cd,In,Zr,Sn,Ce,Ca,Ga,B,Sb,Tl,Pb,Nb,Ta,Bi,Li,Mo,W,V,Pb,Hf 1 2 Z Z Ag,Cu,Ni,Fe,Pd,Co,Au,Pt,Cr,Mo,W,Ti,Zr,Hf,V,Nb,Ta,Ge,Sn,Pb 1 2 Y. NN X Ti,Zr,Al,Fe,Cr,Cr,Mo,V,Si 1 2 Z Z Ag,Cu,Ni,Fe,Pd,Co,Au,Pt,Cr,Mo,W 1 2 Y. FF X Be,Mg,Ca,Al,Ti,Si,Cr 1 2 Z Z Ag,Cu,Ni,Fe,Pd,Co,Au,Pt,Cr,Mo,W,Ti,Zr 1 2 Y. HH X La,Ca,Li,Ti,K,Na,U,Mg,Ni,Co,V,Fe,Mn,Ce,Al,Y,Zr 1 2 Z Z Ag,Cu,Ni,Fe,Pd,Co,Au,Pt,Cr,Mo,W,Ti,Zr,Mg 1 2 Y. Thus, a porous Ni-Ti alloy embedded in powder mixture of Ni oxide, Ni, and Al2O3, and heated in Ar to give a porous structure containing anatase-type photocatalytic TiO<sub>2</sub> particles and rutile-type TiO<sub>2</sub> particles.

IT 566144-25-0

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
 (starting material; in production of porous structure containing functional compound fine particles dispersed in overall position)

RN 566144-25-0 HCAPLUS

CN Iron alloy, base, Fe 44,Pt 39,Cr 9.9,Ni 4.9,Ti 3.2 (9CI) (CA INDEX NAME)

Component	Component	Component
	Percent	Registry Number
Fe	44	7439-89-6
Pt	39	7440-06-4
Cr	9.9	7440-47-3
Ni	4.9	7440-02-0
Ti	3.2	7440-32-6

IC ICM C22C001-08  
 ICS C22C032-00

CC 56-4 (Nonferrous Metals and Alloys)  
 Section cross-reference(s): 52, 59, 74

ST porous material dispersion functional fine particle; oxide particle dispersion porous material prepn; nitride particle dispersion porous

material prepn; fluoride particle dispersion porous material prepn; hydride particle dispersion porous material prepn; photocatalyst particle dispersion porous material prepn; compd catalyst particle dispersion porous material prepn; hydrogen absorbing particle dispersion porous material prepn

- IT Catalysts  
 (compds., functional particles; production of porous structure containing  
 functional compound fine particles dispersed in overall position)
- IT Catalysts  
 (photochem., compds., functional particles; production of porous structure containing functional compound fine particles dispersed  
 in overall position)
- IT 566144-25-0  
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
 (starting material; in production of porous structure containing functional compound fine particles dispersed in overall position)

L4 ANSWER 8 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
 AN 2001:66867 HCAPLUS Full-text

DN 134:240034

TI Electrode performance of Pt-Cr-Ni alloy catalysts for oxygen electrode in polymer electrolyte fuel cell

AU Shim, Joongpyo; Lee, Hong-Ki

CS Environmental Energy Tech. Div., Lawrence Berkeley National Lab., California, 94720, USA

SO Han'guk Chaeleyo Hakhoechi (2000), 10(12), 831-837

CODEN: HCHAEU; ISSN: 1225-0562

PB Materials Research Society of Korea

DT Journal

LA Korean

AB To improve the catalytic activity of platinum on polymer electrolyte fuel cell(PEFC), platinum was alloyed with cobalt and nickel at various temperature By XRD, it was observed the crystal structure of alloy catalysts were the ordered face centered cubic(f.c.c) due to the superlattice line at 33°. As heat-treatment temperature was increased, the particle size of alloys also were increased and the crystalline lattice parameters were decreased. According to the results from mass activity, specific activity and Tafel slope measured by cell performance test and cyclic voltammogram, the catalyst activities of alloys are higher than that pure platinum.

IT 64136-44-3

RL: DEV (Device component use); USES (Uses)  
 (electrode performance of Pt-Cr-Ni alloy catalysts for oxygen electrode in polymer electrolyte fuel cell)

RN 64136-44-3 HCAPLUS

CN Chromium alloy, nonbase, Cr,Ni,Pt (9CI) (CA INDEX NAME)

Component	Component
	Registry Number

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Cr	7440-47-3
Ni	7440-02-0
Pt	7440-06-4

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 56, 67, 72ST conjugated polymer methanofullerene solar cell morphol; platinum  
chromium nickel alloy catalyst electrode

IT Crystal structure

Fuel cell cathodes

(electrode performance of Pt-Cr-Ni alloy catalysts for  
oxygen electrode in polymer electrolyte fuel cell)

IT Fuel cells

(polymer electrolyte; electrode performance of Pt-Cr-Ni alloy  
catalysts for oxygen electrode in polymer electrolyte  
fuel cell)

IT Platinum alloy, base

RL: DEV (Device component use); USES (Uses)  
(electrode performance of Pt-Cr-Ni alloy catalysts for  
oxygen electrode in polymer electrolyte fuel cell)

IT 64136-44-3 77950-55-1, Nafion 115

RL: DEV (Device component use); USES (Uses)  
(electrode performance of Pt-Cr-Ni alloy catalysts for  
oxygen electrode in polymer electrolyte fuel cell)

L4 ANSWER 9 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN

AN 1998:656008 HCAPLUS Full-text

DN 129:262813

OREF 129:53505a,53508a

TI electrochemical catalysts, electrochemical reaction device  
and electrochemical elements using the catalysts,  
phosphoric acid fuel cells and methanol fuel cellsIN Mitsuda, Noriaki; Yoshioka, Shoji; Urushibata, Hiroaki; Fukumoto,  
Hisatoshi; Maeda, Hideo

PA Mitsubishi Electric Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 19 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

PATENT NO.

KIND DATE

APPLICATION NO.

DATE

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 PI JP 10270055 A 19981009 JP 1997-71962  
 199703  
 25

PRAI JP 1997-71962 19970325

AB The electrochem. catalysts containing ≥2 different catalytic components of different rest potential connected by an ionic conductor and an electron conductor. The catalyst components may contain 2 Pt alloy catalysts containing different non-Pt metals selected from Ni, Cr, Co, and Fe; or contain Pt or Pt black and a Pt alloy containing Mo, Ru, Sn, Fe, and/or W. Electrochem. devices and electrochem. elements use the catalysts for their pos. electrodes. H<sub>3</sub>PO<sub>4</sub> fuel cells and fuel cells supplied directly with MeOH as fuel use the catalysts for their cathodes or anodes.

IT 64136-44-3  
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)  
 (catalysts containing ionic and electron conductors connecting different catalytic components for fuel cell electrodes)

RN 64136-44-3 HCAPLUS  
 CN Chromium alloy, nonbase, Cr,Ni,Pt (9CI) (CA INDEX NAME)

Component	Component Registry Number
Cr	7440-47-3
Ni	7440-02-0
Pt	7440-06-4

IC ICM H01M004-90  
 ICS B01J023-89; C25B011-06

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST ST electrochem catalyst platinum alloy compn structure; fuel cell electrode platinum alloy catalyst; phosphoric acid fuel cell electrode catalyst; electron conductor multicomponent catalyst connection; ionic conductor multicomponent catalyst connection; methanol fuel cell electrode catalyst

IT Carbon black, uses  
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)  
 (catalysts containing ion conductors and carbon black electron conductors connecting different catalytic components for fuel cell electrodes)

IT Catalysts

Electric conductors

Fuel cell electrodes

(catalysts containing ionic and electron conductors connecting different catalytic components for fuel cell electrodes)

IT 7664-38-2, Phosphoric acid, uses

RL: DEV (Device component use); USES (Uses)

(catalysts containing ion conductors and phosphoric acid ion conductors connecting different catalytic components for fuel cell electrodes)

IT 7440-06-4, Platinum, uses 11107-69-0 64136-44-3

91810-23-0

RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)

(catalysts containing ionic and electron conductors connecting different catalytic components for fuel cell electrodes)

IT 67-56-1, Methanol, miscellaneous

RL: MSC (Miscellaneous)

(catalysts containing ionic and electron conductors connecting different catalytic components for methanol anodes in fuel cells)

OSC.G 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L4 ANSWER 10 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN

AN 1997:55888 HCAPLUS Full-text

DN 126:77448

OREF 126:14937a,14940a

TI Platinum-aluminum alloy catalyst for fuel cells and its preparation

IN Freund, Andreas; Lehmann, Thomas; Starz, Karl-Anton; Heinz, Gerhard; Schwarz, Robert

PA Degussa AG, Germany

SO Eur. Pat. Appl., 16 pp.

CODEN: EPXXDW

DT Patent

LA German

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 743092	A1	19961120	EP 1996-106596	199604 26
EP	743092	B1	19990901		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, NL, PT,				

SE DE 19517598	C1	19970102	DE 1995-19517598	199505 13
AT 183946	T	19990915	AT 1996-106596	199604 26
US 5767036	A	19980616	US 1996-646394	199605 08
JP 09017435	A	19970117	JP 1996-115061	199605 09
JP 2880450	B2	19990412		

PRAI DE 1995-19517598 A 19950513

#### ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The catalyst is PtpAlqMr, where p:q atomic ratio is 85:15-60:40, (p + q):r atomic ratio is 85:15-50:50, and M is  $\geq 1$  element selected from Group VIB, VIIIB, VIII, and IB elements. M is selected from Cr, Mo, W, Mn, Fe, Co, Ni, Rh, and Au. The catalyst exists on a conductive C support as a carbide having a structure of Pt3AlC0.5. The catalyst is prepared from aqueous suspension of conductive C support and aqueous solns. of alloy components.

IT 185390-47-0P

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
(catalyst for fuel cells and its preparation)

RN 185390-47-0 HCAPLUS

CN Platinum alloy, base, Pt 77,Cr 14,Ni 5.2,Al 3.6 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	77	7440-06-4
Cr	14	7440-47-3
Ni	5.2	7440-02-0
Al	3.6	7429-90-5

IC ICM B01J023-42

ICS B01J023-89; H01M004-92

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 56, 67

ST platinum aluminum alloy catalyst fuel cell; chromium  
platinum aluminum alloy catalyst; molybdenum platinum  
aluminum alloy catalyst; tungsten platinum aluminum alloy  
catalyst; manganese platinum aluminum alloy catalyst

; iron platinum aluminum alloy catalyst; cobalt platinum aluminum alloy catalyst; nickel platinum aluminum alloy catalyst; rhodium platinum aluminum alloy catalyst  
 ; gold platinum aluminum alloy catalyst

- IT Fuel cell electrodes  
 (catalytic; aluminum-platinum alloy)
- IT 56320-40-2P 185390-39-0P 185390-40-3P 185390-41-4P  
 185390-42-5P 185390-43-6P 185390-44-7P 185390-45-8P  
 185390-46-9P 185390-47-0P 185390-48-1P 185390-49-2P  
 185390-50-5P, Aluminum platinum carbide (AlPt<sub>3</sub>C<sub>0.5</sub>)  
 RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
 (catalyst for fuel cells and its preparation)
- OSC.G 35 THERE ARE 35 CAPLUS RECORDS THAT CITE THIS RECORD (47 CITINGS)
- L4 ANSWER 11 OF 15 HCPLUS COPYRIGHT 2009 ACS on STN  
 AN 1997:1502 HCPLUS Full-text  
 DN 126:163438  
 OREF 126:31487a,31490a  
 TI Changes in cathode catalyst structure and activity in phosphoric acid fuel cell operation  
 AU Maoka, T.; Kitai, T.; Segawa, N.; Ueno, M.  
 CS Heavy Apparatus Engineering Lab., Toshiba Corp., Kawasaki, 210, Japan  
 SO Journal of Applied Electrochemistry (1996), 26(12), 1267-1272  
 CODEN: JAELBJ; ISSN: 0021-891X  
 PB Chapman & Hall  
 DT Journal  
 LA English  
 AB Changes in the cathode catalyst structure and activity obtained from a small size phosphoric acid fuel cell (PAFC) operated for various times up to 1200 h, were examined. The platinum surface oxide reduction potential in cyclic voltammograms (CV) shifted in the pos. direction with cell operation. This may be one of the manifestations of the activity enhancement for the oxygen reduction reaction (ORR). It was assumed that this activity increase for the ORR was caused by an increase in the surface roughness, due to the dissoln. of the alloyed base metals. Changes in the platinum chemical state of the alloy surface, from PtO to Pt, and growth of the Pt (110) plane would also contribute to this effect.
- IT 64136-44-3  
 RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); USES (Uses)  
 (platinum alloy catalyst change to platinum with fuel cell operation and platinum oxide reduction potential shifted in pos.

direction with increase in oxygen reduction activity)

RN 64136-44-3 HCPLUS

CN Chromium alloy, nonbase, Cr,Ni,Pt (9CI) (CA INDEX NAME)

Component Component  
Registry Number

Cr	7440-47-3
Ni	7440-02-0
Pt	7440-06-4

CC 72-2 (Electrochemistry)

Section cross-reference(s): 52, 67

ST cathode catalyst structure activity fuel cell; phosphoric acid fuel cell cathode catalyst; oxygen electroredn platinum crystallite

IT Fuel cell cathodes

(changes in cathode catalyst structure and activity in phosphoric acid fuel cell operation)

IT Reduction catalysts

(electrochem.; changes in cathode catalyst structure and activity in phosphoric acid fuel cell operation)

IT Crystallites

(size of platinum: changes in cathode catalyst structure and activity in phosphoric acid fuel cell operation)

IT Platinum alloy

RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); USES (Uses)

(platinum alloy catalyst change to platinum with fuel cell operation and platinum oxide reduction potential shifted in pos.

direction with increase in oxygen reduction activity)

IT 7664-38-2, Phosphoric acid, uses

RL: DEV (Device component use); USES (Uses)

(changes in cathode catalyst structure and activity in phosphoric acid fuel cell operation)

IT 7440-06-4, Platinum, uses 60596-33-0 64136-44-3

RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); USES (Uses)

(platinum alloy catalyst change to platinum with fuel cell operation and platinum oxide reduction potential shifted in pos.

direction with increase in oxygen reduction activity)

IT 7782-44-7, Oxygen, properties

RL: PRP (Properties); RCT (Reactant); RACT (Reactant or reagent)

(platinum alloy catalyst change to platinum with fuel cell operation and platinum oxide reduction potential shifted in

pos.

direction with increase in oxygen reduction activity)  
 OSC.G 5 THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD (5  
 CITINGS)

L4 ANSWER 12 OF 15 HCPLUS COPYRIGHT 2009 ACS on STN  
 AN 1989:602888 HCPLUS Full-text

DN 111:202888

OREF 111:33580h,33581a

TI Fuel-cell-electrode platinum catalyst and its preparation  
 with carbon supports and carbides

IN Tsurumi, Kazunori; Nakamura, Toshihide; Sato, Akira

PA Tanaka Kikinzoku Kogyo K. K., Japan

SO Eur. Pat. Appl., 10 pp.

CODEN: EPXXDW

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 329626	A1	19890823	EP 1989-830062	198902 17
	EP 329626 R: DE, GB, IT	B1	19930512		
	JP 01210035	A	19890823	JP 1988-36248	198802 18
	US 4985386	A	19910115	US 1989-312684	198902 17

PRAI JP 1988-36248 A 19880218

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A Pt catalyst, useful for fuel-cell electrodes, comprises C supports  
 and the carbides of Pt and  $\geq 1$  metal selected from Ni, Co, Cr, and  
 Fe, and, if necessary, of Mn, supported on the C supports. The  
 catalyst possesses superior catalyst performance because the catalyst  
 metals are firmly fixed to the C supports by carburizing. The  
 process for preparing the platinum catalyst includes alloying the  
 metals by employing their organic acid amine salts. This alloying  
 requires a lower temperature than that in a conventional process so  
 that the movement of the metals which leads to agglomeration thereof  
 can be advantageously prevented.

IT 123553-84-4

RL: CAT (Catalyst use); USES (Uses)  
 (catalysts from carbon and)

RN 123553-84-4 HCAPLUS  
 CN Platinum alloy, base, Pt 78,Ni 12,Cr 10 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Pt	78	7440-06-4
Ni	12	7440-02-0
Cr	10	7440-47-3

IC ICM B01J027-22  
 ICS B01J023-89; H01M004-92  
 CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)

ST platinum catalyst carbon support; fuel cell electrode  
 platinum catalyst

IT Catalysts and Catalysis  
 (from metal carbides and carbon, preparation of)

IT Electrodes  
 (fuel-cell, catalytic, metal carbide-carbon catalysts for)

IT 11130-49-7, Chromium carbide 12624-23-6, Platinum carbide 12640-64-1, Iron carbide 12710-36-0, Nickel carbide 12777-96-7, Manganese carbide 37256-04-5, Nickel 50, platinum 50(atomic) 37274-26-3, Iron 50, platinum 50(atomic) 39305-53-8, Cobalt 50, platinum 50(atomic) 51177-04-9, Cobalt carbide 77506-59-3, Chromium 50, platinum 50(atomic) 123553-82-2 123553-83-3  
 123553-84-4 123553-85-5

RL: CAT (Catalyst use); USES (Uses)  
 (catalysts from carbon and)

IT 7440-44-0, Carbon, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalysts from metal carbides and)

IT 7772-98-7  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (reductant, in platinum-containing catalyst preparation)

IT 7681-57-4, Sodium metabisulfite  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (reductant, in platinum-containing catalysts preparation)

OSC.G 11 THERE ARE 11 CAPLUS RECORDS THAT CITE THIS RECORD (11 CITINGS)

L4 ANSWER 13 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN

AN 1989:561421 HCAPLUS Full-text

DN 111:161421

OREF 111:26800a

TI Process for alloying metals on supports for catalysts  
 IN Tsurumi, Kazunori; Nakamura, Toshihide; Sato, Akira  
 PA Tanaka Kikinzoku Kogyo K. K., Japan  
 SO Eur. Pat. Appl., 6 pp.  
 CODEN: EPXXDW

DT Patent  
 LA English  
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 330627	A1	19890830	EP 1989-830063	198902 17
	EP 330627 R: DE, GB, IT	B1	19911106		
	JP 01210037	A	19890823	JP 1988-36250	198802 18
	JP 2556874	B2	19961127		
	US 4954474	A	19900904	US 1989-312671	198902 17

PRAI JP 1988-36250 A 19880218

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A process for alloying metals on catalyst inorg. supports comprises applying the solution of an organic acid amine salt of a 2nd metal onto the inorg. supports already supporting a 1st metal; reducing the salt to the corresponding metal; and alloying the metals by heating. The alloying of the metals can be performed at a relatively low temperature, therefore, a highly active binary or ternary catalyst having a large surface area can be obtained.

IT 64136-44-3P

RL: SPN (Synthetic preparation); PREP (Preparation)  
(preparation of, on catalyst support)

RN 64136-44-3 HCPLUS

CN Chromium alloy, nonbase, Cr,Ni,Pt (9CI) (CA INDEX NAME)

Component Component  
Registry Number

Cr	7440-47-3
Ni	7440-02-0
Pt	7440-06-4

IC ICM B01J023-89  
 ICS B01J023-64; B01J037-00; H01M004-92

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction  
 Mechanisms)  
 ST alloying on catalyst support  
 IT Carbon black, uses and miscellaneous  
 RL: USES (Uses)  
     (alloying on catalyst support of)  
 IT Catalysts and Catalysis  
     (alloying on supports in preparation of)  
 IT 7439-89-6, Iron, reactions 7440-02-0, Nickel, reactions  
 7440-06-4, Platinum, reactions 7440-47-3, Chromium, reactions  
 7440-48-4, Cobalt, reactions  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
     (alloying of, on catalyst support)  
 IT 7440-44-0, Carbon, uses and miscellaneous  
 RL: USES (Uses)  
     (alloying on catalyst support of)  
 IT 11134-15-9P 12623-52-8P 12623-53-9P 60596-33-0P  
 64136-44-3P 91033-96-4P  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
     (preparation of, on catalyst support)  
 OSC.G 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3  
     CITINGS)

L4 ANSWER 14 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
 AN 1982:459398 HCAPLUS Full-text  
 DN 97:59398

OREF 97:9933a,9936a  
 TI Catalytically active metal alloy  
 IN Barnabe, Jean Louis  
 PA Regie Nationale des Usines Renault, Fr.  
 SO Ger. Offen., 16 pp.  
 CODEN: GWXXBX

DT Patent  
 LA German

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	DE 3026777	A1	19820211	DE 1980-3026777	198007 15
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DE 3026777	C2	19830728
PRAI DE 1980-3026777		19800715
AB Alloys for exhaust gas catalyst contains Fe 40-80, Cr 0-40, Ni 0-40, C 0.02-0.1, ≥1 of Pt-group metals 0.05-2, preferably Pt 0.05-0.2, Ru 0.1-0.2, Rh 0.02-0.1, and Pd 0.05-0.2 %, and Ce, Cu, Mo, Ti, La, Ca, Y, Al, W, and Mn as activators or stabilizers. The alloys are melted		

in air or vacuum, quenched from .apprx.1150°, crushed into small pieces, followed by repeated quenching from 1050-1150° and tempering at 400-800° in 30 min-10 h to sensitize to intergranular corrosion, pickling in HCl-HNO<sub>3</sub> solution, then in aqueous 20% HCl, 2 h in 5-30 % oxalic acid at 60-90; and then oxidation at .apprx.350°. The intergranular corrosion can also be effected by anodic oxidation in 1% acid solution, the alloy being the anode, at .apprx.3 V and <30 min. Thus, an Fe alloy [82512-83-2] containing Cr 25, Ni 20, Pt 0.2, Ru 0.15, Rh 0.05, and C 0.3% was rolled to 0.05 mm, quenched from 1050°, tempered 8 h at 600°, etched 30 min in concentrated HNO<sub>3</sub> containing 10% HCl, then 2 min in 20% HCl, 2 h in 20% oxalic acid at 80° to form Fe and Ni oxalates, oxidized at 350° to form powdered Fe and Ni oxides, and tested in combustion gases containing CO 1.5, O 0.8% propylene or propane 400 and N oxide 2000 ppm. At the test temperature of 300-500° the efficiency of the catalyst was 90% for CO, 95 for C<sub>3</sub>H<sub>6</sub>, and 95 for N oxide, and, after aging 5 h at 700°, the resp. efficiency values were 53, 63, and 68, i.e., still acceptable.

IT 82512-83-2

RL: CAT (Catalyst use); USES (Uses)  
(catalysts, for automobile exhaust converters)

RN 82512-83-2 HCPLUS

CN Iron alloy, base, Fe 54,Cr 25,Ni 20,C 0.3,Pt 0.2,Ru 0.2 (9CI) (CA  
INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	54	7439-89-6
Cr	25	7440-47-3
Ni	20	7440-02-0
C	0.3	7440-44-0
Pt	0.2	7440-06-4
Ru	0.2	7440-18-8

IC C22C038-00; B01J023-89

CC 55-3 (Ferrous Metals and Alloys)

Section cross-reference(s): 59, 67

ST catalyst converter iron chromium nickel; exhaust  
automobile catalyst converter; platinum iron  
catalyst converterIT Air pollution  
(by exhaust gases, alloys for catalysts for prevention  
by)IT Exhaust gases  
(catalysts for)

IT Platinum-group metals

RL: USES (Uses)  
     (in iron alloy catalysts, for automobile exhaust  
     converters)

IT 82512-83-2

RL: CAT (Catalyst use); USES (Uses)  
     (catalysts, for automobile exhaust converters)

IT 7440-16-6, uses and miscellaneous

RL: USES (Uses)  
     (in iron alloy catalysts, for automobile exhaust  
     converters)

RE.CNT 1        THERE ARE 1 CITED REFERENCES AVAILABLE FOR THIS RECORD  
           ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 15 OF 15 HCAPLUS COPYRIGHT 2009 ACS on STN  
 AN 1977:522044 HCAPLUS Full-text  
 DN 87:122044  
 OREF 87:19325a,19328a  
 TI Catalytic purification of ventilation discharges in the  
     production of medical preparation  
 AU Doronina, L. M.; Eshenbakh, L. F.; Ivanova, G. A.  
 CS Gos. Nauchno-Issled. Inst. Prom. Sanit. Ochist. Gazov, Dzerzhinsk,  
     USSR  
 SO Promyshlennaya i Sanitarnaya Ochistka Gazov (1977), (1), 14-15  
 CODEN: PSGADK; ISSN: 0131-5498  
 DT Journal  
 LA Russian  
 AB The catalytic conversion of iso-PrOH [67-63-0] (4 mg/L) and phenol  
     [108-95-2] (0.2 mg/L) by 5 catalysts (Al-Pt, CuO, Cu-Cr, Pt-Ni-Cr,  
     and Fe-Cr) was studied. A conversion of 98 - 100% was achieved with  
     Cu-Cr and Al-Pt catalysts at 270° for iso-PrOH and at 340° for  
     phenol. The Al-Pt catalyst, AP-56, was recommended for industrial  
     use as it is also suitable for oxidation of HCl commonly present in  
     effluent gases from pharmaceutical plants.  
 IT 64136-44-3  
 RL: CAT (Catalyst use); USES (Uses)  
     (oxidation catalysts, in removal of isopropanol and  
     phenol, from waste gases from pharmaceuticals manufacture)  
 RN 64136-44-3 HCAPLUS  
 CN Chromium alloy, nonbase, Cr,Ni,Pt (9CI) (CA INDEX NAME)

Component	Component
	Registry Number
Cr	7440-47-3
Ni	7440-02-0
Pt	7440-06-4

CC 59-2 (Air Pollution and Industrial Hygiene)  
Section cross-reference(s): 63, 67

ST waste gas treatment pharmaceutical manuf; isopropanol removal waste  
gas; phenol removal waste gas; oxidn catalyst waste gas  
treatment

IT Oxidation catalysts  
(in removal of isopropanol and phenol from waste gases, from  
pharmaceuticals manufacture)

IT Waste gases  
(removal of isopropanol and phenol from, oxidation catalysts  
in)

IT 1317-38-0, uses and miscellaneous 11099-27-7 11122-73-9  
37334-74-0 64136-44-3

RL: CAT (Catalyst use); USES (Uses)  
(oxidation catalysts, in removal of isopropanol and  
phenol, from waste gases from pharmaceuticals manufacture)

IT 67-63-0, uses and miscellaneous 108-95-2, uses and miscellaneous  
RL: REM (Removal or disposal); PROC (Process)  
(removal of, from waste gases, from pharmaceuticals manufacture,  
oxidation catalysts in)

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